401 KAR 59:015. New indirect heat exchangers.

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
Department for Environmental Protection
Division for Air Quality

Relates to: KRS Chapter 224
Pursuant to: KRS 224.10-100
Necessity and Function: KRS 224.10-100 requires the Department for Natural
Resources and Environmental Protection to prescribe regulations for the
prevention, abatement, and control of air pollution. This regulation provides
for the control of emissions from new indirect heat exchangers.

Section 1. Applicability.
The provisions of this regulation shall apply to each affected facility
commenced on or after the applicable classification date defined below. Any
affected facility subject to 401 KAR 59:016 is not subject to this regulation.

Section 2. Definitions.
As used in this regulation, all terms not defined herein shall have the
meaning given them in 401 KAR 50:010.

(1)   "Affected facility" means an indirect heat exchanger having a heat input
        capacity of more than one (1) million BTU per hour.

(2)   "Indirect heat exchanger" means any piece of equipment, apparatus or
        contrivance used for the combustion of fuel in which the energy produced
        is transferred to its point of usage through a medium that does not come
        in contact with or add to the products of combustion.

(3)   "Classification date" means:
        (a)   August 17, 1971 for affected facilities with capacity of more than
                250 million BTU per hour heat input with respect to particulate
                emissions, sulfur dioxide emissions and (if fuels other than
                lignite are burned) nitrogen oxide emissions;

        (b)   April 9, 1972 for affected facilities with a capacity of 250
                million BTU per hour heat input or less with respect to
                particulate emissions and sulfur dioxide emissions;

        (c)   December 22, 1976 for affected facilities with a capacity of more
                than 250 million BTU per hour heat input with respect to nitrogen
                oxides if lignite is the fuel burned.

Section 3. Method for Determining Allowable Emission Rates.

(1)   Except as provided in subsection (3) of this section, the total rated
        heat input capacity of all affected facilities within a source,
        including those for which an application to construct, modify or
        reconstruct has been submitted to the department, shall be used as
        specified in Sections 4 and 5 to determine the allowable emissions in
        terms of pounds of effluent per million BTU input.

(2)   At such time as any affected facility is assigned an allowable emission
        rate by the department, at no time thereafter shall that rate be changed
        due to inclusion or shutdown of any affected facility at the source.

(3)   (a)   A source may petition the department to establish an allowable
                emission rate which may be apportioned without regard to
                individual heat input provided that the conditions specified in

paragraphs (b),(c),(d) and (e) of this subsection are met. Such allowable emission rate shall be determined according to the following equation:

$F = (AB + DE)/C$ Where:

A =   the allowable emission rate (in pounds per million BTU input) as determined according to subsection (1) of this section;

B =   the total rated heat input (in millions of BTU per hour) of all affected facilities commenced on or after the applicable classification date within a source, including those for which an application to construct, modify, or reconstruct has been submitted to the department;

C =   the total rated heat input (in millions of BTU per hour) of all affected facilities within a source, including those for which an application to construct, modify, or reconstruct has been submitted to the department;

D =   the allowable emission rate (in pounds per million BTU input) as determined according to 401 KAR 61:015, Section 3(1);

E =   the total rated heat input (in millions of BTU per hour) of all affected facilities commenced before the applicable classification date.

F =   the alternate allowable emission rate (in pounds per actual million BTU input).

(b)   At no time shall the owner or operator of the source allows the total emissions (in pounds per hour) from all affected facilities within the source divided by the total actual heat input (in millions of BTU per hour) of all affected facilities within the source to exceed the alternate allowable emission rate as determined by paragraph (a) of this subsection.

(c)   At no time shall the owner or operator of any source subject to federal new source performance standards allow the emissions from any affected facility commenced on or after the applicable classification date to exceed the allowable emission rate determined by use of that affected facility's rated heat input (instead of the heat input as determined by subsection (1) of this section) as specified in Sections 4 and 5.

(d)   The owner or operator of the source must demonstrate compliance with this subsection by conducting a performance test according to 401 KAR 50:045 on each affected facility under such conditions as may be specified by the department.

(e)   Upon petition, the department will establish an alternate emission rate in accordance with this subsection if the owner or operator demonstrates to the department's satisfaction that the source will maintain compliance with this subsection on a continual basis.

Section 4. Standard for Particulate Matter.
Except as provided in Section 3(3), no owner or operator of an affected

facility subject to the provisions of this regulation shall cause to be discharged into the atmosphere from that affected facility, particulate matter in excess of that specified below:

(1)   For sources having a total heat input capacity, as determined by Section 3(1), which is:
       (a)   Ten (10) million BTU per hour or less, the standard is 0.56 pounds per million BTU actual heat input;

       (b)   250 million BTU per hour or more, the standard is 0.10 pounds per million BTU actual heat input;

       (c)   For heat input values between those specified in paragraphs (a) and (b) of this subsection, the standard in pounds per million BTU actual heat input, is equal to:

              0.9634 times that quantity obtained by raising the total heat input capacity (in millions of BTU per hour) to the -0.2356 power;

(2)   Emissions which exhibit greater than twenty (20) percent opacity except:
       (a)   That, for indirect heat exchangers with heat input capacity of 250 million BTU per hour or more, a maximum of twenty-seven (27) percent opacity shall be permissible for not more than one (1) six (6) minute period in any sixty (60) consecutive minutes.

       (b)   That, for indirect heat exchangers with heat input capacity of less than 250 million BTU per hour, a maximum of forty (40) percent opacity shall be permissible for not more than six (6) consecutive minutes in any sixty (60) consecutive minutes during cleaning the fire box or blowing soot.

       (c)   For emissions from an indirect heat exchanger during building a new fire for the period required to bring the boiler up to operating conditions provided the method used is that recommended by the manufacturer and the time does not exceed the manufacturer's recommendations.

Section 5.   Standard for Sulfur Dioxide.
Except as provided in Section 3(3), no owner or operator of an affected facility subject to the provisions of this regulation shall cause to be discharged into the atmosphere from that affected facility, any gases which contain sulfur dioxide in excess of that specified below:

(1)   For sources which have a total heat input capacity, as determined by Section 3(1), which is:
       (a)   Ten (10) million BTU per hour or less, the standard is three (3.0) pounds per million BTU actual heat input for combustion of liquid and gaseous fuels and five (5.0)pounds per million BTU actual heat input for combustion of solid fuels;

       (b)   250 million BTU per hour or more, the standard is 0.8 pounds per million BTU actual heat input for combustion of liquid and gaseous fuels and 1.2 pounds per million BTU actual heat input for combustion of solid fuels;

       (c)   For heat input values between those specified in paragraphs (a) and (b) of this subsection, the standard in pounds per million BTU actual heat input, is equal to:
              1.   For combustion of liquid and gaseous fuels, 7.7223 times that quantity obtained by raising the total heat input capacity (in millions of BTU per hour) to the -0.4106 power;

2. For combustion of solid fuels, 13.8781 times that quantity obtained raising the total heat input capacity (in millions of BTU per hour) to the -0.44434 power.

(2) When different gases are burned simultaneously in any combination the applicable standard shall be determined by proration using the equation given in Appendix A of this regulation.

(3) Compliance shall be based on the total heat input from all fuels burned, including gaseous fuels.

Section 6. Standard for Nitrogen Oxides.

(1) No owner or operator of an affected facility with a heat input capacity of 250 million BTU per hour or more subject to the provisions of this regulation shall cause to be discharged into the atmosphere any gases which contain nitrogen oxides expressed as nitrogen dioxide in excess of:
(a) 0.20 lb. per million BTU heat input (0.36 g. per million cal) derived from gaseous fuel;

(b) 0.30 lb. per million BTU heat input (0.54 g. per million cal) derived from liquid fuel;

(c) 0.70 lb. per million BTU heat input (1.26 g. per million cal) derived from solid fuel (except lignite);

(d) 0.60 lb. per million BTU heat input (1.08 g. per million cal) derived from lignite or lignite and wood residue except as provided under paragraph (e) of this subsection;

(e) 0.80 lb. per million BTU derived from lignite which is mined in North Dakota, South Dakota, or Montana and which is burned in a cyclone-fired unit.

(2) Except as provided in subsections (3) and (4) of this section, when different fuels are burned simultaneously in any combination, the applicable standard shall be determined by proration using the equation given in Appendix B to this regulation.

(3) When a fossil fuel containing at least twenty-five (25) percent by weight, of coal refuse is burned in combination with gaseous, liquid, or other solid fossil fuel or wood residue, the standard for nitrogen oxides does not apply.

(4) Cyclone-fired units which burn fuel containing at least twenty-five (25) percent of lignite that is mined in North Dakota, South Dakota, or Montana remain subject to subsection (1)(e) of this section regardless of the types of fuel combusted in combination with that lignite.

Section 7. Emission and Fuel Monitoring.
The provisions of this section shall apply to any affected facility of more than 250 million BTU per hour rated heat input capacity.

(1) Each owner or operator shall install, calibrate, maintain, and operate continuous monitoring systems for measuring the opacity of emissions, sulfur dioxide emissions, nitrogen oxides emissions and either oxygen or carbon dioxide except as provided in subsection (2) of this section.

(2) Certain of the continuous monitoring system requirements under subsection (1) of this section do not apply to owners or operators under the following conditions:

(a)   For an indirect heat exchanger that burns only gaseous fuel, continuous monitoring systems for measuring the opacity of emissions are not required;

(b)   For an indirect heat exchanger that burns only natural gas, wood, wood residue, or any combination thereof, continuous monitoring systems for measuring sulfur dioxide emissions are not required;

(c)   Notwithstanding 401 KAR 59:005, Section 4(2), installation of a continuous monitoring system for nitrogen oxides may be delayed until after the initial performance tests under 401 KAR 59:005, Section 2, have been conducted. If the owner or operator demonstrates during the performance test that emissions of nitrogen oxides are less tn seventy (70) percent of the applicable standards in Section 6, a continuous monitoring system for measuring nitrogen oxide emissions is not required. If the initial performance test results show that nitrogen oxide emissions are greater than seventy (70) percent of the applicable standard, the owner or operator shall install a continuous monitoring system for nitrogen oxides within one (1) year after the date of the initial performance tests under 401 KAR 59:005, Section 2, and comply with all other applicable monitoring requirements under this chapter;

(d)   If an owner or operator does not install any continuous monitoring systems for sulfur oxides and nitrogen oxides, as provided under paragraphs (a) and (c) or paragraphs (b) and (c) of this subsection, a continuous monitoring system for measuring either oxygen or carbon dioxide is required.

(e)   For an indirect heat exchanger that does not use a flue gas desulfurization device, a continuous monitoring system for measuring sulfur dioxide emissions is not required if the owner or operator monitors sulfur dioxide emissions by fuel sampling and analysis under subsection (6) of this section.

(3)   For performance evaluation under 401 KAR 59:005, Section 4(3) and calibration checks under 401 KAR 59:005, Section 4(4), the following procedures shall be used:
(a)   Reference Methods 6 or 7, filed by reference in 401 KAR 50:015, as applicable, shall be used for conducting performance evaluations of sulfur dioxide and nitrogen oxides continuous monitoring systems;

(b)   Sulfur dioxide or nitric oxide, as applicable, shall be used for preparing calibration gas mixtures under Performance Specification 2 of Appendix B to 40 CFR 60,filed by reference in 401 KAR 50:015;

(c)   For affected facilities burning fossil fuel(s), the span value for a continuous monitoring system measuring the opacity of emissions shall be eighty (80), ninety(90), or 100 percent and for a continuous monitoring system measuring sulfur oxides or nitrogen oxides the span value shall be determined as shown in Appendix C of this regulation;

(d)   All span values computed under paragraph (c) of this subsection for burning combinations of fuels shall be rounded to the nearest 500 ppm;

(e)   For an indirect heat exchanger that simultaneously burns fossil fuel and nonfossil fuel, the span value of all continuous monitoring systems shall be subject to the department's approval.

(4)   A continuous monitoring system for measuring either oxygen or carbon
       dioxide in the flue gases, shall be installed, calibrated, maintained
       and operated by the owner or operator.

(5)   For any continuous monitoring system installed under subsection (1) of
       this section, the following conversion procedures shall be used to
       convert the continuous monitoring data into units of the applicable
       standards (ng/J,lb/million BTU):
       (a)   When a continuous monitoring system for measuring oxygen is
              selected, the measurement of the pollutant concentration and
              oxygen concentration shall each be on a consistent basis (wet or
              dry). Alternative procedures approved by the department and the
              U.S. Environmental Protection Agency shall be used when
              measurements are on a wet basis. When measurements are on a dry
              basis, the following conversion procedure shall be used:

              $$E = (20.9CF)/(20.9 - \% \text{ oxygen}), \text{ where:}$$

                     E, C, F, and % oxygen are determined under subsection (6) of
                     this section.

       (b)   When a continuous monitoring monitoring system for measuring
              carbon dioxide is selected, the measurement of a pollutant
              concentration and carbon dioxide concentration shall each be on a
              consistent basis (wet or dry) and the following conversion
              procedure shall be used: $E = (100CF_c)(\% \text{ carbon dioxide})$ where:
              E, C, F_c and % carbon dioxide are determined under subsection (6) of
              this section.

(6)   The values used in the equations under subsection (5)(a) and (b) of this
       section are derived as follows:
       (a)   E = Pollutant emission, g/million cal (lb/million BTU).

       (b)   C = Pollutant concentration, g/dscm (lb/dscf), determined by
              multiplying the average concentration (ppm) for each one (1) hour
              period by .0000415 M g/dscm per ppm (2.59 times ten (10) raised to
              the negative nine (9) power times M lb/dscf per ppm) where M =
              pollutant molecular weight, g/g-mole (lb/lb-mole).

              M = 64.07 for sulfur dioxide and 46.01 for nitrogen oxides.

       (c)   F, Fc = a factor representing a ratio of the volume of dry flue
              gases generated to the calorific value of the fuel combusted (f),
              and a factor representing a ratio of the volume of carbon dioxide
              generated to the calorific value of the fuel combusted (Fc),
              respectively, as follows (ASTM designations are filed by reference
              in 401 KAR 50:015):
              1.   For anthracite coal as classified according to ASTM D388-
                    66(72), F = 10,140 dscf/million BTU and Fc = 1980 scf
                    CO_2/million BTU.

              2.   For sub-bituminous coal as classified according to ASTM
                    D388-66(72), F = 10,140 dscf/million BTU and Fc = 1980 scf
                    CO_2/million BTU.

              3.   For liquid fossil fuels including crude, residual, and
                    distillate oils, F = 9220 dscf/million BTU and Fc = 2430 scf
                    CO_2/million BTU.

              4.   For gaseous fossil fuels, F = 8740 dscf/million BTU. For
                    natural gas, propane and butane fuels, Fc = 1040 scf

CO_2/million BTU for natural gas, 1200 scf CO_2/million BTU for propane, and 1260 scf CO_2/million BTU for butane.

5.   For bark, F = 9575 dscf/million BTU and Fc = 1927 scf CO_2/million BTU. For wood residue other than bark, F = 9233 dscf/million BTU and Fc = 1842 scf CO_2/million BTU.

6.   For lignite coal as classified according to ASTM D388-66(72), F = 9900 dscf/million BTU and Fc = 1920 scf CO_2/million BTU.

(d)   The owner or operator may use the equation given in Appendix D of this regulation to determine an F factor (dscm/million cal, or dscf/million BTU) on a dry basis (if it is desired to calculate F on a wet basis, consult with the department) or Fc factor (scm CO_2/million cal, or scf CO_2/million BTU) on either basis in lieu of the F or Fc factors specified in paragraph (c) of this subsection.

1.   H,C,S,N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent), respectively, as determined on the same basis as GCV by ultimate analysis of the the fuel fired using ASTM method D3178-73 or D3176-74 (solid fuels) or computed from results using ASTM methods D1137-53 (75), D1945-64(73), or D1946-67(72)(gaseous fuels) as applicable.

2.   GVC is the gross calorific value (cal/g, BTU/lb) of the fuel combusted determined by ASTM test methods D2015-66(72) for solid fuels and D1826-64(70) for gaseous fuels as applicable.

(e)   For affected facilities firing combinations of fuels, the F or Fc factors determined by paragraphs (c) and (d) of this subsection shall be prorated in accordance with the applicable formula as given in Appendix E of this regulation.

(7)   For the purpose of reports required under 401 KAR 59:005, Section 3(3), periods of excess emissions that shall be reported are defined as follows:

(a)   Excess emissions are defined as any six (6) minute period during which the average opacity of emissions exceeds twenty (20) percent opacity, except that one (1) six (6) minute average per hour of up to twenty-seven (27) percent opacity need not be reported.

(b)   Sulfur dioxide. Excess emissions for affected facilities are defined as: Any three(3) hour period during which the average emissions (arithmetic average of three(3) contiguous one (1) hour periods) of sulfur dioxide as measured by a continuous monitoring system exceed the applicable standard under Section 5.

(c)   Nitrogen oxides. Excess emissions for affected facilities using a continuous monitoring system for measuring nitrogen oxides are defined as any three (3) hour period during which the average emissions (arithmetic average of three (3) contiguous one (1) hour periods) exceed the applicable standards under Section 6.

(8)   The department may require for any indirect heat exchanger unit of 250 million BTU per hour heat input or less any or all the emission and fuel monitoring required by this section.

Section 8. Test Methods and Procedures.

(1)   The reference methods in Appendix A of 40 CFR 60 except as provided in
       401 KAR 50:045 shall be used to determine compliance with the standards
       as prescribed in Sections 4,5, and 6 as follows:
       (a)   Reference Method 1 for the selection of sampling site and sample
              traverses;

       (b)   Reference Method 3 for gas analysis to be used when applying
              Reference Methods 5,6, and 7;

       (c)   Reference Method 5 for concentration of particulate matter and the
              associated moisture content;

       (d)   Reference Method 6 for the concentration of sulfur dioxide;

       (e)   Reference Method 7 for the concentration of nitrogen oxides; and

       (f)   Reference Method 9 for visible emissions.

(2)   For Reference Method 5, Reference Method 1 shall be used to select the
       sampling site and the number of traverse sampling points. The sampling
       time for each run shall be at least sixty (60) minutes and the minimum
       sampling volume shall be 0.85 dscm (30 dscf) except that smaller
       sampling times or volumes, when necessitated by process variables or
       other factors, may be approved by the department. The probe and filter
       holder heating systems in the sampling train shall be set to provide a
       gas temperature no greater than 160 $^{\circ}$C (320 $^{\circ}$F).

(3)   For Reference Methods 6 and 7, the sampling site shall be the same as
       that selected for Reference Method 5. The sampling point in the duct
       shall be at the centroid of the cross section or at a point no closer to
       the walls than one (1) m (3.28 ft.) For Reference Method 6, the sample
       shall be extracted at a rate proportional to the gas velocity at the
       sampling point.

(4)   For Reference Method 6, the minimum sampling time shall be twenty (20)
       minutes and the minimum sampling volume shall be 0.02 dscm (0.71 dscf)
       for each sample. The arithmetic mean of two (2) samples shall
       constitute one (1) run. Samples shall be taken at approximately thirty
       (30) minute intervals.

(5)   For Reference Method 7, each run shall consist of at least four (4) grab
       samples taken at approximately fifteen (15) minute intervals. The
       arithmetic mean of the samples shall constitute the run value.

(6)   For each run using the methods specified by subsection (1)(a), (b) and
       (c) of this section, the emissions expressed in g/million cal
       (lb/million BTU) shall be determined by the following procedure: E =
       (20.9 CF)(20.9-% oxygen) where:
       (a) E =   pollutant emission, g/million cal (lb/million BTU),

       (b) C =   pollutant concentration, g/dscm (lb/dscf),
                    determined by Reference Methods 5,6 or 7.

       (c) % oxygen =   oxygen content by volume (expressed as percent), dry
                         basis. Percent oxygen shall be determined by using
                         the integrated or grab sampling and analysis
                         procedures as Reference Method 3 as applicable. The
                         sample shall be obtained as follows:
              1.   For determination of sulfur dioxide and nitrogen oxides
                     emissions, the oxygen sample shall be obtained
                     simultaneously at the same point in the duct as used to
                     obtain the samples for Reference Methods 6 and 7

determinations, respectively. For Reference Method 7, the oxygen sample shall be obtained using the grab sampling and analysis procedures of Reference Method 3.

    2.   For determination of particulate emissions, the oxygen sample shall be obtained simultaneously by traversing the duct at the same sampling location used for each run of Reference Method 5 under subsection (2) of this section. Reference Method 1 shall be used for selection of the number of traverse points except that no more than twelve (12) sample points are required.

    (d) F =   a factor as determined in Section 7(6)(c), (d), or (e).

(7)   When combination of fossil fuels are fired, the heat input, expressed in cal/hr (BTU/hr), shall be determined during each testing period by multiplying the gross calorific value of each fuel fired by the rate of each fuel burned. Gross calorific value shall be determined in accordance with ASTM methods D 2015- 66(72) (solid fuels), D240-76 (liquid fuels), or D1826- 64(70)(gaseous fuels) as applicable. The rate of fuels burned during each testing period shall be determined by suitable methods and shall be confirmed by a material balance over the steam generation system.

Effective Date: January 7, 1981

	Date Submitted to EPA	Date Approved by EPA	Federal Register
Original Reg	JUN 29, 1979	JUL 12, 1982	47 FR 30059
1st Revision	SEP 24, 1982	MAR 22, 1983	48 FR 11945

APPENDIX A TO 401 KAR 59:015
DETERMINATION OF ALLOWABLE SULFUR DIOXIDE EMISSION

Allowable sulfur dioxide emission in pounds per million BTU per hour heat input

$$= \frac{y(a) + z(b)}{y + z}$$

Where:

y   is the percent of total heat input derived from liquid or gaseous fuel,

z   is the percent of total heat input derived from solid fuel,

a   is the allowable sulfur dioxide emission in pounds per million BTU heat input derived from liquid or gaseous fuel, and

b   is the allowable sulfur dioxide emission in pounds per million BTU heat input derived from solid fuel.

DETERMINATION OF ALLOWABLE NITROGEN DIOXIDE EMISSION

Allowable nitrogen dioxide emission in pounds per million BTU/hour heat input

$$= \frac{x(0.20) + y(0.30) + z(0.70) + w(0.60)}{x + y + z + w}$$

Where:

x   is the percent of total heat input derived from gaseous fuel,

y   is the percent of total heat input derived from liquid fuel,

z   is the percent of total heat input derived from solid fuel (except lignite), and

w   is the percent of total heat input derived from lignite.

APPENDIX C TO 401 KAR 59:015
DETERMINATION OF SPAN VALUE
(in parts per million)

Fossil Fuel	Span Value for Sulfur Dioxide	Span Value for Nitrogen Oxides
Gas	*	500
Liquid	1,000	500
Solid	1,500	500
Combinations	$1,000y + 1,500z$	$500(x+y)+1,000z$

*Not applicable

Where:

    x = the fraction of total heat input derived from gaseous fossil fuel,

    y = the fraction of total heat input derived from liquid fossil fuel, and

    z = the fraction of total heat input derived from solid fossil fuel.

APPENDIX D TO 401 KAR 59:015
DETERMINATION OF F OR Fc FACTOR

$$F = \frac{227.2(\%H) + 95.5(\%C) + 35.6\ (\%S) + 8.7\ (\%N) - 28.7\ (\%))}{GCV}$$
(metric units)

$$F = \frac{10^6\ [3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46\ (\%O)]}{GCV}$$
(English units)

$$Fc = \frac{2.0\ x\ 10^{-5}(\%C)}{GCV} \qquad \text{(metric units)}$$

$$Fc = \frac{321\ X\ 10^3\ (\%C)}{GVC} \qquad \text{(English units)}$$

Where:

H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively, as determined on the same basis as GCV by ultimate analysis of the fuel fire, using A.S.T.M. methods D1137-74 (solid fuels) or computed from results using A.S.T.M. methods D1137-53(75), D1945-64(73), or D1946-67(72) (gaseous fuels) as applicable.

GCV is the gross calorific value (cal/g, BTU/lb) of the fuel conbusted, determined by A.S.T.M. test methods D2015-66(72) for solid fuels and D1826-64(70) for gaseous fuels as applicable.

$F = xF_1 + yF_2 + zF_3$

Where:

   x, y, z = the fraction of total heat input derived from gaseous, liquid, and solid fuel, respectively.

   F_1, F_2, F_3 = the value of F for gaseous liquid, and solid fuels respectively under Section 7(6)(c) and (d).

$Fc = \sum_{i=1}^{n} X_i (Fc)i$

Where:

   X_i = the fraction of total heat input derived from each type fuel (e.g., natural gas, butand, crude bituminous coal, etc.)

   (Fc)i = the applicable Fc factor for each fuel type determined in accordance with Section 7(6)*c) and (d).